FACED MINERAL FIBER INSULATION BOARD WITH INTEGRAL GLASS FABRIC LAYER

BACKGROUND OF THE INVENTION

[0001] The invention relates generally to the field of building material products and, in particular, to insulated air ducts and methods for making the same.

BRIEF SUMMARY OF THE INVENTION

[0002] Ducts and conduits are used to convey air in building heating, ventilation and air conditioning (HVAC) systems. Often these ducts are formed of sheet metal and as a result do not possess good thermal or acoustical insulating properties. In order to enhance these insulation properties, sheet metal ducts are often insulated using mineral fiber insulation board which is installed around the metal ducts. The insulation board is often manufactured to include a facing material which acts as a vapor retarder/air barrier. Such facing material may be, for example, a FSK (foil/scrim/kraft) facing, a PSK (poly/scrim/kraft) facing, or an ASJ (all-service jacket) facing. In some applications, especially where the ducts or plenum will be subjected to outdoor exposure, a weather-resistant glass fabric and mastic coating is applied to the mineral fiber board insulation that has been installed onto the duct or plenum exterior.

[0003] Referring to FIG. 1, a prior art insulated duct 10 is shown having a rectangular duct 20, a mineral fiber insulation board 22, a facing material 24, a glass fabric 26 and a mastic coating 28.

[0004] The mineral fiber insulation board 22 is commonly composed of glass fibers bonded together with a thermosetting resin. The insulation board 22, is faced with a facing material 24, such as FSK (foil/scrim/kraft), PSK (poly/scrim/kraft) or ASJ (all-service jacket) to act as an air barrier/vapor retarder. A mastic coating 28 reinforced with a glass fabric or mesh 26 is applied to the facing material 24 to supply a weather barrier.

[0005] Typically, where a weather barrier is to be applied, a first coat of the mastic coating 28 is brushed, troweled or sprayed onto the facing material after the faced insulation board has been installed over the duct 20. The glass fabric 26, which is typically provided in the form of

a roll, is cut to the proper dimensions and embedded into the first coat of the mastic coating 28. After embedding the glass fabric 26, a second coat of the mastic coating 28 is brushed, troweled or sprayed onto the glass fabric 26 to continuously cover the faced insulation board with the glass-reinforced mastic coating.

[0006] The process of having to cut and fit the glass fabric at the installation site is fairly labor-intensive and thus adds costs to the building project.

[0007] What is needed is an improved insulation product and method for installing the insulation product around ducts.

SUMMARY OF THE INVENTION

[0008] One aspect of the present invention is a method of insulating ducts including laminating a reinforcement fabric to a fibrous insulation board, lifting at least a portion of the reinforcement fabric from the fibrous insulation board, applying a first layer of a mastic coating to the fibrous insulation board, embedding the reinforcement fabric into the first layer of mastic coating, and applying a second layer of the mastic coating to the outside surface of the reinforcement fabric. The reinforcement fabric is laminated to the fibrous insulation board using an adhesive material.

[0009] Another aspect of the invention is an insulation product for installation around ducts including a fibrous insulation board and a reinforcement fabric laminated to the fibrous insulation board. The reinforcement fabric is laminated to the fibrous insulation board using an adhesive material.

[0010] A further aspect of the invention is an insulation product for installation around ducts including a fibrous insulation board, a facing material applied to the fibrous insulation board, and a reinforcement fabric laminated to the facing material. The reinforcement fabric is laminated to the facing material using an adhesive material.

BRIEF SUMMARY OF THE SEVERAL VIEWS OF THE DRAWINGS

[0011] Figure 1 is an isometric view of a prior art insulated duct.

[0012] Figure 2 is a cross-sectional view of an exemplary fibrous insulation product.

[0013] Figure 3 is a top isometric view of a fibrous insulation product.

DETAILED DESCRIPTION OF THE INVENTION

[0014] This description of the exemplary embodiments is intended to be read in connection with the accompanying drawings, which are to be considered part of the entire written description. In the description, relative terms such as "lower," "upper," "horizontal," "vertical,", "above," "below," "up," "down," "top" and "bottom" as well as derivatives thereof (e.g., "horizontally," "downwardly," "upwardly," etc.) should be construed to refer to the orientation as then described or as shown in the drawing under discussion. These relative terms are for convenience of description and do not require that the apparatus be constructed or operated in a particular orientation. Terms concerning attachments, coupling and the like, such as "connected" and "interconnected," refer to a relationship wherein structures are secured or attached to one another either directly or indirectly through intervening structures, as well as both movable or rigid attachments or relationships, unless expressly described otherwise.

[0015] Referring to FIG. 2, a cross-sectional view of a fibrous insulation product 100 is shown comprising a fibrous insulation board 102, a facing material 104, an adhesive 106, and a reinforcement fabric 108. The figure is not drawn to scale, but rather some elements are exaggerated to better illustrate the product.

[0016] The fibrous insulation board 102 is preferably a mineral fiber insulation board comprised of mineral fibers such as glass fibers, rock wool fibers, slag fibers, alumina silica and basalt fibers resin bonded into a rigid or semi-rigid board. However, the fibrous insulation board 102 may be comprised of organic fibers, such as polyester, polypropylene or other polymeric fibers, or combinations thereof, for example. Although a fibrous insulation board is preferred, cellular insulation boards may also be used. The cellular material may be glass or foamed plastic, for example.

[0017] The facing material 104, which is generally factory-applied during manufacture of the fibrous insulation board, is preferably FSK, but may include any other suitable vapor retarder, such as ASJ (all-service jacket), or PSK (poly/scrim/kraft).

[0018] The adhesive 106 is preferably a removable adhesive, a permanent adhesive or a repositionable adhesive. The removable adhesive may be any suitable removable adhesive including water-based adhesives, hot melt glues, pressure sensitive adhesives, or heat-activated adhesives, including those sold by Henkel Adhesives Corporation of Elgin, IL and Bostik Findley of Wauwatosa, WI. The removable adhesive may be in the form of a tape or a liquid, such as a spray or molten strip, for example. The removable adhesive may be applied in a substantially continuous coating, or may be applied intermittently, such as in the form of strips or dots, for example.

[0019] Suitable hot melt adhesives include, for example, Henkel product numbers 80-8669 and 80-8726 manufactured by Henkel Adhesives Corp. of Elgin, IL. The hot melt adhesives are preferably applied in dots (or drops), as sprayed stripes, or as thin molten strips. Where applied in drops, preferably the drops are applied to the facing in rows of between approximately 3 to 6 inches apart. The drops are preferably spaced between approximately 3 to 6 inches apart, have a volume of approximately between 0.0005 to 0.005 cubic inches, more preferably about 0.002 cubic inches, and weigh approximately between about 0.007 to 0.075 gram/drop, and more preferably about 0.03 gram/drop. Where the hot melt is applied as sprayed stripes, preferably the stripes are approximately between 1/2 to 1 inch in width, and more preferably 3/4 inch in width, and weigh between approximately 0.05 to 0.15 gram/lineal foot, and more preferably 0.1 gram/lineal foot. Preferably the sprayed stripes are spaced between approximately 3 to 6 inches on center of the facing. Where the hot melt adhesive is applied in thin molten strips, preferably the strips are placed between approximately 3 to 6 inches apart and have a weight of between about 0.05 to 0.15 gram/lineal foot, and more preferably about 0.1 gram/lineal foot.

[0020] Suitable waterbase adhesives include, for example, Henkel product numbers 42-5001 and 57-7001 (both vinyl acetate/acrylate blend with rubber based technology)), Henkel product number 57-6153M-2 (vinyl acetate/acrylate blend), and Henkel product number 57-0806 (vinyl acetate/acrylate emulsion). Preferably the waterbased adhesives are spray-applied in a dry weight of approximately between 0.05 to 0.15 gram/lineal foot, more preferably about 0.1 gram/lineal foot, in approximately between 1/2 to 1 inch wide strips, and more preferably 3/4 inch wide strips, which are approximately 3 to 6 inches on center of the facing.

[0021] Where the adhesive 106 is a permanent adhesive, it is preferably applied in strips or dots, or in such other fashion that which uses a sufficiently small amount of adhesive to allow the reinforcement fabric to be readily removed from the facing material 104. The amount of adhesive required may be dependent, for example, on the type of facing material and/or mesh used.

[0022] Preferably the adhesive material is pre-coated onto the facing material in-line during the manufacture of the faced insulation board. Also, preferably, the adhesive material allows the reinforcement fabric 108 to be removed from the facing material 106, as discussed below, without damage to the facing material 106.

[0023] The reinforcement fabric or mesh 108 is preferably an open weave glass fabric or mesh. Although a glass fabric is preferred, the fabric may also be formed of polyester or nylon, for example. Further, other reinforcements fabrics may be used depending on the application and the type of mastic employed, including, for example, canvas, expanded metal lath, metal mesh and wire netting. Preferably the reinforcement fabric 108 has approximately 8 to 10 threads per inch in both warp and weft directions. Some preferred fabrics include, for example, Childers CHIL-GLAS® #10 Glass Fiber Reinforcing Mesh and Foster MAST-A-FAB® White Reinforcing Membrane polyester fabric manufactured by Foster Specialty Construction Brands, Inc. of Palatine, IL, and Carolina Narrow Fabric Company glass fabric manufactured by Carolina Narrow Fabric Company of North Carolina. The reinforcement fabric 108 is adhered or laminated to an outside surface of the facing material 104 by the adhesive 106. The reinforcement fabric may have the same dimensions as the fibrous insulation board 102 or may be wider than the fibrous insulation board 102 to provide a tab 110 for overlapping a fibrous insulation product applied to an adjacent duct section. Facing material 104 may also be wider than the fibrous insulation board 102 to provide a tab 111 for likewise overlapping a fibrous insulation product applied to an adjacent duct section.

[0024] In forming the above described fibrous insulation product 100, a fibrous insulation board 102 is employed which may be produced by any known method. The fibrous insulation board may be, for example, CertaPro Commercial Board (e.g., CB300) manufactured by CertainTeed Corp. of Valley Forge, PA or Knauf Insulation Board manufactured by Knauf

Insulation of Shelbyville, IN. The fibrous insulation board 102 is preferably faced with the facing material 104 during an in-line process, again using known manufacturing processes.

[0025] Advantageously, unlike current techniques for forming and installing fibrous insulation boards around ducts, a reinforcement fabric 108 is further laminated to the facing material 104 of the fibrous insulation board 102. During the insulation board in-line manufacturing process, the fabric 108 may be laminated to the facing material 104 before, during or after lamination of the facing material 104 is applied to the insulation board 102. Preferably, however, the reinforcement fabric 108 is laminated to the facing material 104 prior to the lamination of the facing material 104 to the fibrous insulation board 102. Alternatively, the reinforcement fabric may be laminated to the facing material as an additional step at the end of the insulation board manufacturing process. As described above, the reinforcement fabric 108 is laminated or adhered to the facing material using an adhesive 106. Preferably, the adhesive 106 is applied to an outside surface 112 of the facing material 104, but may alternatively be applied to an inside surface of the reinforcement fabric 108. Depending, for example, on the type of adhesive, the adhesive 106 may be applied in strips or dots to an outside surface 112 of the facing material 104, such as by extruding, for example, or may substantially cover the outside surface 112, or some portion thereof, of the facing material 104 such as by roll-coating or spraying, for example. Where the adhesive 106 is applied to an inside surface of the reinforcement fabric 108, preferably the adhesive would be roll-coated onto the fabric 108. The lamination of the reinforcement fabric to the faced insulation board during the insulation board manufacturing process may reduce end-use installation labor costs by avoiding the requirement of sizing and cutting the reinforcement fabric at the installation site. By laminating the reinforcement fabric onto the faced insulation board during the manufacturing process, the reinforcement fabric is already sized to the proper dimensions.

[0026] Referring to FIG. 3, a method of installing the above-described fibrous insulation product includes laminating or adhering a reinforcement fabric to the facing of a faced insulation board during manufacture of the board, installing the reinforcement fabric-laminated faced insulation board around a duct, lifting at least a portion of the reinforcement fabric from the faced fibrous insulation board, applying a first coat of a mastic coating to the facing

material of the faced insulation board, embedding the reinforcement fabric into the first coat of the mastic coating, and applying a second coat of the mastic coating to the reinforcement fabric.

[0027] In installing the reinforcement fabric-laminated faced insulation board 100 around a duct, such as a metal HVAC duct, the insulation board 100 will be cut or grooved, using either hand tools or a grooving machine, to allow the board to be folded to conform to the shape of the duct. Either before, or preferably after, the insulation board 100 is installed around the duct, the reinforcement fabric 108, or a portion thereof, is lifted from the facing material 104 (or fibrous insulation board 102 if the board 100 is unfaced). The adhesive material 106 preferably allows the reinforcement fabric 108 to be readily removed from facing without damage to the facing material. In the embodiment shown in FIG. 3, the adhesive material 106 has been applied to the facing material 104 in the form of dots.

[0028] Once the reinforcement fabric 108 is lifted from the facing material, a first layer of mastic coating 120 can be applied to the facing material 104. The mastic coating may be, for example, Foster's VAPOR-FAS™ WB Coating #30-65, Foster's WEATHERITE™ Mastic #46-50, Childers AK-CRYL™ CP-9, Childers VI-CRYL™ CP-10 or CP-11, Childers CHIL-PERM® CP-30 Low Odor Vapor Barrier Coating, each manufactured by Foster Specialty Construction Brands, Inc. of Palatine, IL, or Hy-Tech Thermal Solutions #RVBM-4 Vapor Barrier Mastic manufactured by Hy-Tech Thermal Solutions, LLC of Melbourne, FL. The first layer of mastic is preferably applied to the facing at a rate of approximately 2 gallons/100 square feet (approximately 0.03 inch wet thickness). Once the first layer of mastic coating has been applied, the reinforcement fabric 108 is then embedded in the first layer of mastic coating. A second layer of mastic coating 120 may then be applied to outside surface 115 of the reinforcement fabric 108 to form a reinforced mastic coating. The second layer of mastic coating is preferably applied at a rate of 3 to 4 gallons/100 square feet (approximately 0.045 to 0.06 inch wet thickness).

[0029] The mastic coating may be any type suitable for the application. Preferably, the mastic coating is an emulsion or solvent type mastic coating, including a vinyl acrylic or asphaltic base mastic.

[0030] Although the invention has been described in terms of exemplary embodiments, it is not limited thereto. Rather, the appended claims should be construed broadly, to include other

variants and embodiments of the invention, which may be made by those skilled in the art without departing from the scope and range of equivalents of the invention. For example, although shown and described with reference to a square or rectangular-shaped duct, the fibrous insulation product can be produced and installed to fit around any shaped duct, including round, oval or irregularly shaped ducts. Further, the fibrous insulation product may be used to insulate other building elements, such as plenums, chillers and other equipment.